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Detecting Thrust Bearing Failures on Screw Compressors

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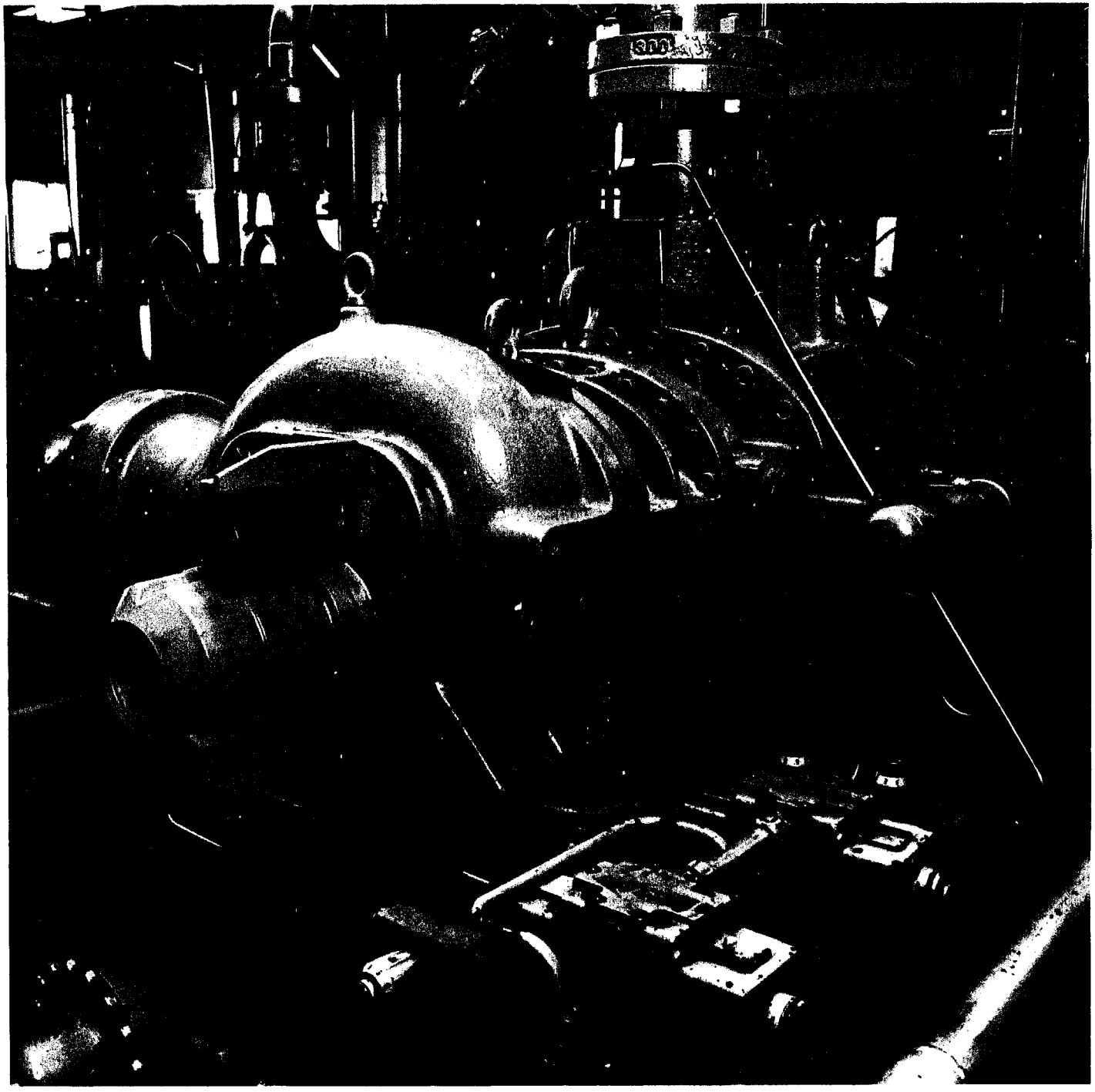
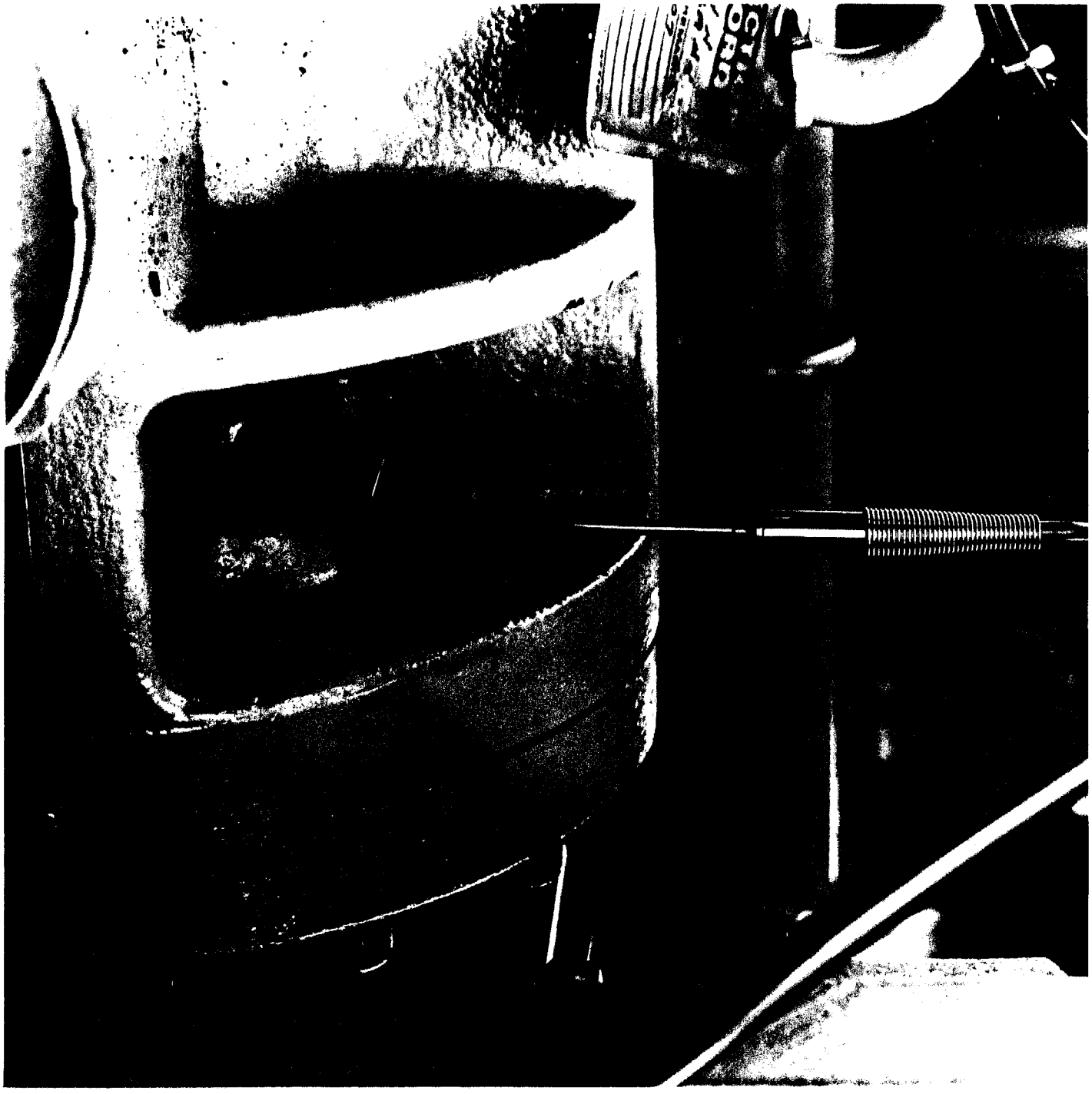
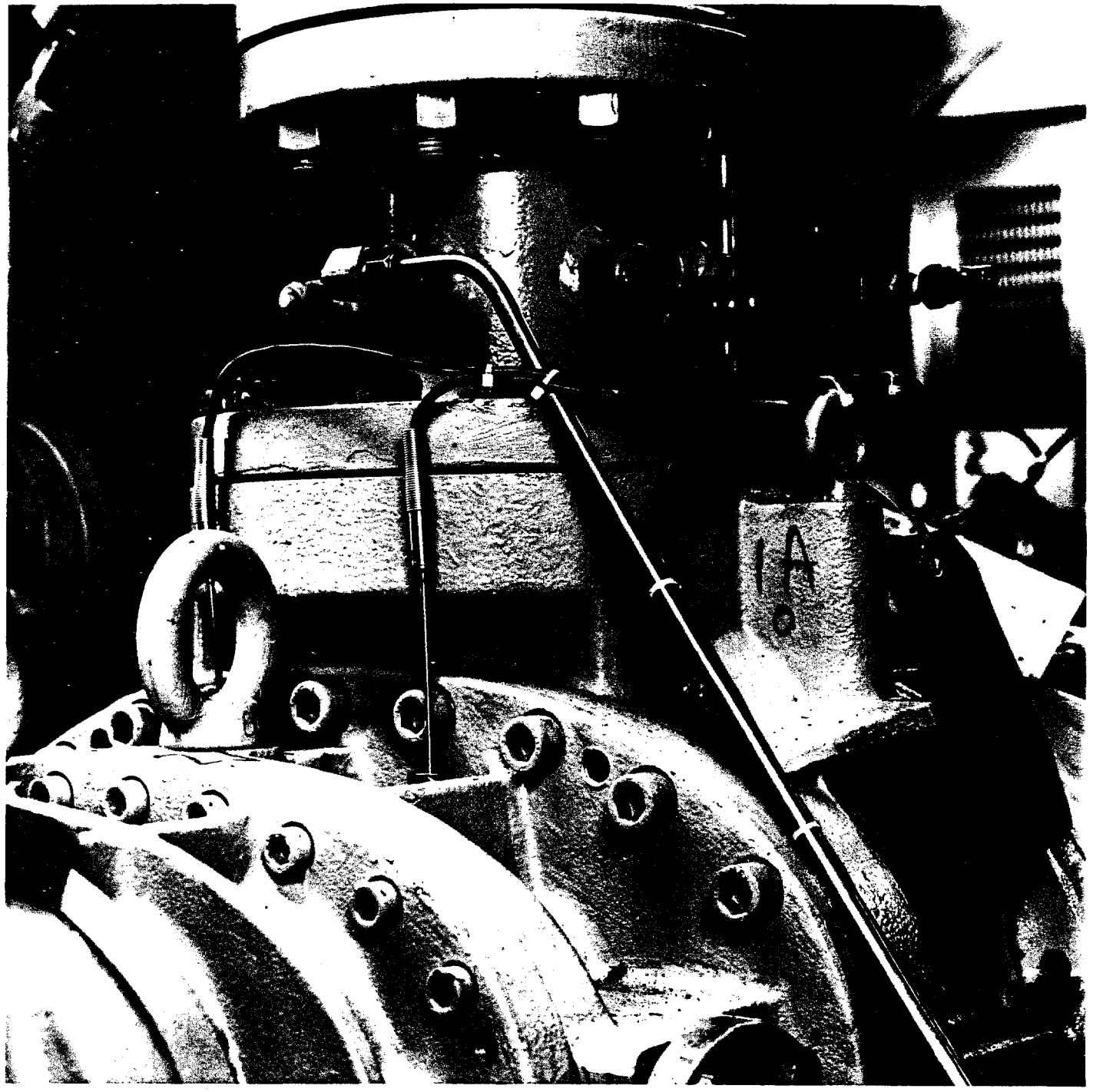
Detecting Thrust Bearing Failures On Screw Compressors

Fermi National Accelerator Laboratory uses thirty–four 400 hp compound two stage helium gas screw compressors to compress and liquefy gas for the Tevatron ring of superconducting magnets. Over 1.5 million hours of operating time has been registered on these machines. The compressor manufacture recommended overhauling the machines at 18 thousand hours of operation. Many of our machines are approaching the 40 thousand hour mark. The life of these compressors is determined by the rotor thrust bearings. When these bearings fail, the rotor moves axially and will within approximately 100 hours strike the case causing extensive damage and expensive repair. An inexpensive shaft movement indicator was designed and is used to shutdown the machine when the final stage drive rotor bearings fail. These bearings historically are the first to fail. The mating high stage rotor bearings and the low stage bearings are unprotected. It would be difficult and costly to install rotor shaft position indicators on the other shafts. These compressors are totally oil flooded machines making only the most expensive type of vibration indicators a possible method to warn us of bearing failure.

An economical way to possibly detect bearing failure is to measure the temperature on the outer race of the thrust bearings. Four holes were drilled in the housing and a special design spring loaded thermocouple was inserted at each bearing location. These thermocouples are type "T" copper/constantan with the reference point on the main oil supply to the bearings. Four machines are now being continuously monitored. Upon bearing failure of one of these machines the amount and time of temperature rise of the bad bearing should enable us to provide the information required to incorporate a low cost reliable method to shutdown our compressors.






14